

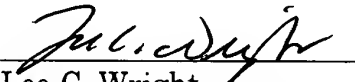
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REMARKS

The changes made to the claims are for clarity and to conform with U.S. claiming practice. New claims 23-29 correspond to the preferable subject matter of original claims 7, 13-17 and 19, respectively. Entry and consideration of this Amendment are respectfully requested.

Respectfully submitted,

SUGHRUE MION, PLLC
2100 Pennsylvania Avenue, N.W.
Washington, D.C. 20037-3213
Telephone: (202) 293-7060
Facsimile: (202) 293-7860


Lee C. Wright
Registration No. 41,441

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APPENDIX

VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE TITLE:

The title is changed as follows:

METHOD FOR THE PRODUCTION OF [PREPARING] CROSS-LINKED
AND/OR FUNCTIONALIZED BITUMEN/POLYMER COMPOSITIONS AND USE
OF SAID COMPOSITIONS IN COVERINGS [THEIR APPLICATION IN THE
MAKING OF PAVEMENTS]

IN THE ABSTRACT:

The following was inserted on a separate sheet as the abstract:

ABSTRACT

Compositions produced by forming a homogenous mass consisting of a
bitumen matrix wherein a cross-linked and/or functionalized elastomer produced in
situ from a precursor elastomer is dispersed in a uniform manner and makes up 0.5
- 30% of the weight of the bitumen matrix. The bitumen matrix is created by
associating 95 % - 20 wt. % non oxidized bitumen having a penetrability of 20-900
and 5-80 wt. % oxidized bitumen having a penetrability of 10-90. The compositions
can be used as bitumen binders in the production of coverings.

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IN THE CLAIMS:

The claims are amended as follows:

1 (amended). [- Method] A method for preparing cross-linked and/or functionalized bitumen/polymer compositions with a low susceptibility to temperature, wherein, when operating at temperatures that range between 100°C and 230°C and under agitation, [we form] forming a homogenous mass that represents the bitumen/polymer composition and is made of a bituminous matrix in which is uniformly dispersed a cross-linked and/or functionalized elastomer, made from a precursor elastomer used in a quantity that ranges between 0.5% and 30% of the weight of the bituminous matrix, where said method is characterized [in that we made] by making the bituminous matrix by associating, by weight, x% of a non oxidized bitumen with a penetrability that ranges between 20 and 900 and y% of an oxidized bitumen, with a penetrability that ranges between 10 and 90, where said penetrabilities are determined as set forth in the NF standard T 66004 and are expressed in 1/10 mm, where the values of x and y are such that $20 \leq x \leq 95$ and $5 \leq y \leq 80$ with $x + y = 100$.

2 (amended). The method [Method] as set forth in claim 1, characterized in that the weight percentages x% of non oxidized bitumen and y% of oxidized bitumen, associated to form the bituminous matrix of the bitumen/polymer composition are such that $35 \leq x \leq 85$ and $15 \leq y \leq 65$ with $x + y = 100$.

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3 (Amended). The method [Method] as set forth in claim 1 [or 2], characterized in that the quantity of precursor elastomer represents from 1.5% to 20% of the weight of the bituminous matrix.

4 (Amended). The method [Method] as set forth in [one of claims 1 through 3] claim 1, characterized in that the non oxidized bitumen, entering in the making of the bituminous matrix, consists of one single bitumen or of a mixture of bitumens taken from among the straight-run bitumens, the refinery bitumens under reduced pressure, the propane or pentane deasphalting residues and viscosity breaking residues.

5 (amended). The method [Method] as set forth in claim 4, characterized in that the non oxidized bitumen is one bitumen or a mixture of bitumens taken from among the straight-run bitumens.

6 (Amended). The method [Method] as set forth in [one of claims 1 through 5] claim 1, characterized in that the oxidized bitumen, associated with the non oxidized bitumen to make up the bituminous matrix, consists of one single oxidized bitumen or of a mixture of oxidized bitumens taken from among the blown bitumens and the semi-blown bitumens.

7 (Amended). The method [Method] as set forth in [one of claims 1 through 6] claim 1, characterized in that the penetrability of the non oxidized bitumen, used in

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making the bituminous matrix, ranges between 35 and 500 [and especially between 160 and 330].

8 (Amended). The method [Method] as set forth in [one of claims 1 through 7] claim 1, characterized in that the penetrability of the oxidized bitumen, used in making the bituminous matrix, ranges between 20 and 60.

9 (Amended). The method [Method] as set forth in [one of claims 1 through 8] claim 1, characterized in that the oxidized bitumen, associated with the non oxidized bitumen to make the bituminous matrix, has a ring and ball softening point as defined in the NF standard T 66008, that ranges between 60°C and 120°C.

10 (Amended). The method [Method] as set forth in [one of claims 1 through 9] claim 1, characterized in that the precursor elastomer consists of at least one copolymer chosen from among the random or block copolymers of styrene and of a conjugated diene, namely butadiene, isoprene, chloroprene, carboxylic butadiene or carboxylic isoprene.

11 (amended). The method [Method] as set forth in claim 10, characterized in that the precursor elastomer consists of one or several copolymers chosen from among the linear or star block copolymers, with or without a random hinge, of styrene and of butadiene, of styrene and of isoprene, of styrene and of chloroprene, of styrene and of carboxylic butadiene or alternatively of styrene and of carboxylic isoprene.

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12 (Amended). The method [Method] as set forth in claim 10 [or 11], characterized in that the copolymers of styrene and of conjugate diene have a styrene content that ranges between 5% and 50% by weight.

13 (Amended). The method [Method] as set forth [in one of claims 10 through 12] claim 10, characterized in that the copolymers of styrene and of conjugated diene have, prior to the cross-linking and/or functionalization, average molecular masses by weight that range between 10 000 daltons and 600 000 daltons [and preferably between 30 000 daltons and 400 000 daltons].

14 (Amended). The method [Method] as set forth in [one of claims 1 through 13] claim 1, characterized in that it consists in putting the non oxidized bitumen and the oxidized bitumen chosen to make the bituminous matrix in contact with, by weight of said matrix, 0.5% to 30% [and preferably 1.5% to 20%] of the precursor elastomer and 0.01% to 6% [and more particularly 0.05% to 3%,] of cross-linking agent and/or a functionalization agent while working at temperatures that range between 100°C and 230°C [and preferably between 130°C and 200°C] and under agitation for a period of time of at least 5 minutes.

15 (Amended). The method [Method] as set forth in claim 14, characterized in that the precursor elastomer is put in contact with the non oxidized and the oxidized bitumens while working at temperatures ranging between 100°C and 230°C[, preferably between 130°C and 200°C] and under agitation for a period of

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time ranging from 5 minutes to 8 hours, [in particular from 30 minutes to 6 hours,] to create a homogenous mixture, then the cross-linking agent and/or functionalization agent is incorporated into said mixture and it is all kept under agitation at temperatures ranging between 100°C and 230°C, [preferably between 130°C and 200°C,] and identical or not to the temperatures at which the precursor elastomer is mixed with the non oxidized and the oxidized bitumens used to make the bituminous matrix, for a period of time that ranges between 5 minutes and 5 hours, [more particularly between 10 minutes and 180 minutes,] to form a reaction product that makes up the cross-linked and/or functionalized bitumen/polymer composition.

16 (Amended). The method [Method] as set forth in [one of claims 1 through 13] claim 1, characterized in that it consists, in a first phase, in preparing a concentrate by putting from 50% to 100% of the non oxidized bitumen to be used to make the bituminous matrix in contact with, by weight of said matrix, 5% to 30% of the precursor elastomer and 0.01% to 6%[, and more particularly 0.05% to 3%,] of a cross-linking agent and/or a functionalization agent to form a cross-linked and/or functionalized bitumen/polymer reaction product that makes up said concentrate while working at temperatures ranging between 100°C and 230°C[, and preferably between 130°C and 200°C,] under agitation during a period of time of at least 5 minutes and then [in], in a second phase in diluting the cross-linked and/or

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functionalization bitumen/polymer reaction that resulted from the first phase and adding to it the oxidized bitumen and the possible remaining fraction of non oxidized bitumen, while operating at temperatures that range between 100°C and 230°C, [preferably between 130°C and 200°C,] under agitation, to form the cross-linked and/or functionalized bitumen/polymer composition.

17 (Amended). The method [Method] as set forth in claim 16, characterized in that the first phase is carried out by putting the precursor elastomer in contact with the non oxidized bitumen, while working at temperatures that range between 100°C and 230°C, [preferably between 130°C and 200°C,] and under agitation for a period of time from 5 minutes to 8 hours, [namely from 30 minutes to 6 hours,] to form a homogenous mass, then in adding to said mixture the cross-linking agent and/or functionalization agent and holding it all under agitation at temperatures that range between 100°C and 230°C, [preferably between 130°C and 200°C] and identical or not to the temperatures at which the precursor elastomer is mixed with the non oxidized bitumen, for a period of time that ranges from 5 minutes to 5 hours, [more particularly between 10 minutes and 180 minutes,] to form the cross-linked and/or functionalized bitumen/polymer reaction product.

18 (Amended). The method [Method] as set forth in [one of claims 14 through 17] claim 14, characterized in that the functionalized elastomer is created within the bituminous matter using a functionalization agent[, namely a functionalization

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agent taken from among the] selected from the group consisting of carboxylic acids or esters bearing thiol or disulfide [groupings] groups and [or from among the] thiolcarboxylic acid polyesters.

19 (Amended). The method [Method] as set forth in [one of claims 1 through 18] claim 1, characterized in that the elastomer is functionalized and [in that we incorporate] one or several reactive additives likely to react with the functional groupings of the elastomer are incorporated into the functionalized bitumen/polymer composition during its preparation where the quantity of the reactive additive(s) ranges from 0.01% to 10% [and more particularly from 0.05% to 5%] of the weight of the bitumen present in the composition.

20 (Amended). The method [Method] as set forth in [one of claims 14 through 17] claim 14, characterized in that the cross-linked elastomer is created within the bituminous matrix, using a cross-linking agent[, namely a cross-linking agent of the] selected from the group consisting of sulfur donor cross-linking [agent type of the] agents and peroxidized [compound type] compounds that generate[s] free radicals at temperatures ranging between 100°C and 230°C.

21 (Amended). The method [Method] as set forth in [one of claims 1 through 20] claim 1, [characterized in that we incorporate] further incorporating one or several additional polymers that are different from the precursor elastomer to the cross-linked and/or functionalized bitumen/polymer composition in an overall

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quantity that ranges between 0.3% and 20% [and preferably between 0.5% and 10%] of the weight of the bitumen of said compositions.

22 (Amended). [Application of the compositions obtained by the method as set forth in any one of claims 1 through 21, as bituminous binders that can be used immediately or following an aqueous emulsion, to make pavements and in particular] A road surface pavement[s, namely of the top coating type, for the making of coated materials that are spread when hot or cold,] or [alternatively for the making of] a watertight facing[s] made from a cross-linked and/or functionalized bitumen/polymer composition made from the method of claim 1.

Claims 23-28 are added as new claims.

ABSTRACT

Compositions produced by forming a homogenous mass consisting of a bitumen matrix wherein a cross-linked and/or functionalized elastomer produced in situ from a precursor elastomer is dispersed in a uniform manner and makes up 0.5 - 30% of the weight of the bitumen matrix. The bitumen matrix is created by associating 95 % - 20 wt. % non oxidized bitumen having a penetrability of 20-900 and 5-80 wt. % oxidized bitumen having a penetrability of 10-90. The compositions can be used as bitumen binders in the production of coverings.
